SURVEILLANCE OF SEAPORT RODENTS AND ITS FLEA–INDICES IN CILACAP, CENTRAL JAVA AND PANJANG, SUMATERA, INDONESIA

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ABSTRAK

Suatu survai terhadap tikus dan pinjal telah diselenggarakan di daerah pelabuhan Cilacap dan Panjang, pada November 1985 sampai Maret 1986.

Dalam survai itu diidentifikasi empat spesies tikus, yaitu *Rattus r. diardii, R. norregicus, Bandicota indica,* dan *Mus musculus,* serta seekor insektivora, *Suncus murinus.* Kepadatan polusi binatang-binatang ini rendah di dalam pelabuhan dan sedang di perkampungan sekitarnya. *R.r. diardii* terbukti merupakan tikus yang terbanyak dijumpai baik di pelabuhan maupun di perkampungan sekitar.

Kepadatan *Xenopsylla cheopis* ternyata rendah baik pada tikus-tikus maupun insektivora di kedua daerah pelabuhan. Indeks pinjal spesifik tertinggi didapatkan pada *R.r. diardii.*

Tes kerentanan *X. cheopis* terhadap insektisida dengan menggunakan DDT 4%, melathion 0,5% dan fenit rothion 1% menunjukkan bahwa pinjal itu lebih sensitif terhadap melathion dan fenitrothion dibanding terhadap DDT, di kedua daerah pelabuhan.

INTRODUCTION

Following the previous surveys of seaport rodents in Semarang, Central Java and Ujung Pandang, South Sulawesi[1], rodent surveillance was extended to two other seaports at Cilacap, Central Java, and Panjang, Sumatera and their adjoining villages. The aims of these surveys are:

1. to assess the rodent density and its flea-indices
2. to evaluate the different insecticides susceptibility to fleas, and
3. to find possible rodent/fleas control measures.

STUDY AREAS

Cilacap Seaport.

The harbour covers an area of 2 hectares. It has 19 godowns, 7 of which are active, and trapping was carried out in these active godowns only. The adjoining villages cover 75 hectares with 6 RW (subvillages) and 44 RT (communes) with a population of 15,262 inhabitants. The village is separated from the harbour by wire fencing only. Trapping was carried out in 4 RW of 31 RT in 1550 houses in the villages. (Fig. 1).

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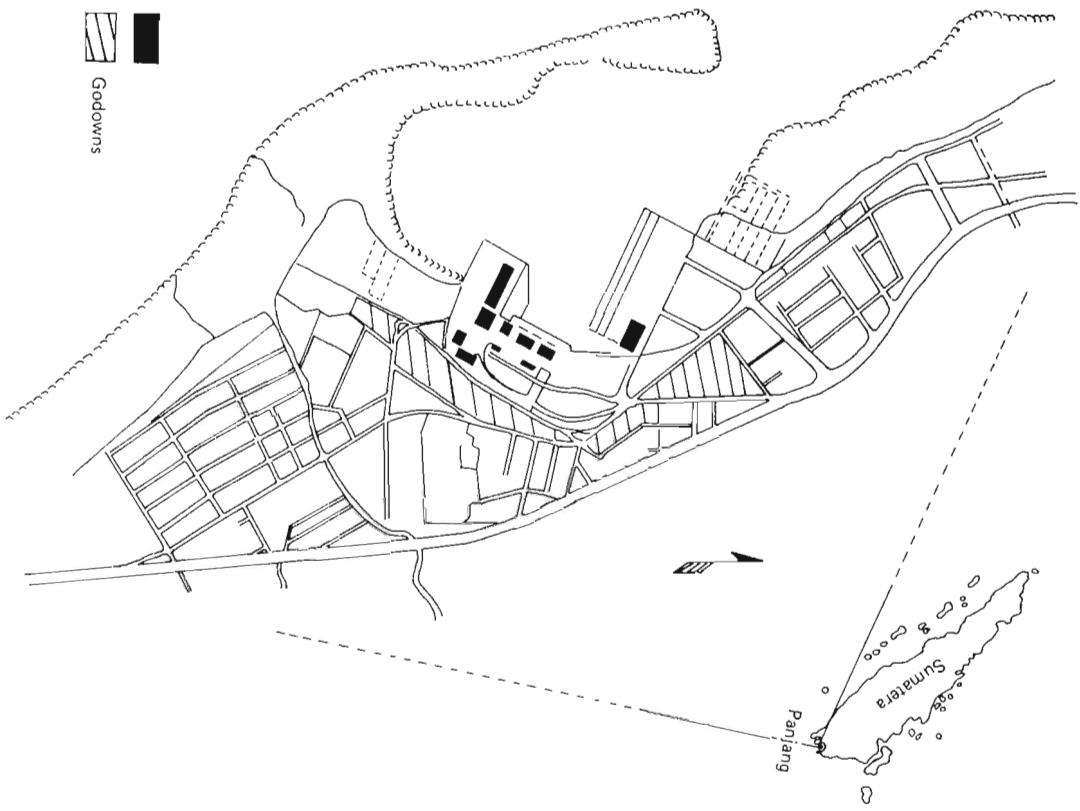
Fig. 1. Cilacap Seaport, Central Java

Panjang Seaport.

The harbour covers 100 hectares. It has 19 godowns, and trapping was carried out in 10 active godowns only. The adjoining villages cover 45 hectares with 35 RW of 132 RT and a population of 35,053 inhabitants. The harbour is surrounded by concrete walls which separated the adjoining villages. Trapping was carried out in 4 RW of 11 RT in 550 houses in the villages (Fig. 2).

Fig 2. Panjang Seaport Lampung Province, Sumatera



METHODS AND MATERIAL

Trapping was carried out during the first week of each month in Panjang harbour and its adjoining villages, and the third week for Cilacap for 4 trap nights each trapping period. In Cilacap harbour 300 traps for each trap night were placed in the godowns, and 200 for Panjang harbour. In their adjoining villages, the number of traps laid varied, 4 per house in large houses, and 2 per house in houses of smaller sizes. All traps were baited with baked coconut.

In each of the harbours, a field laboratory was provided. The procedures of processing trapped animals,

and the recovery of fleas from these animals are in accordance to the laboratory procedures adapted by Megawe et al.[1]

Insecticide susceptibility tests to fleas *(Xenopsylla cheopis)* with 4 % DDT, 0.5 % malathion and 1 % fenitrothion impregnated papers, were carried out following the procedures described in WHO/VBC/75, 588, Rev. 1. The procedures of handling fleas for processing follow that described by Megawe et, al.[1]

RESULTS

Cilacap Seaport and its adjoining villages.

Four species of animals, consisting of 3 rodent spp. and 1 insectivore in the harbour and its adjoining villages were identified. They were *Suncus murinus* (insectivore), *Bandicota indica*, *Rattus r. diardii* and *Mus musculus* (rodents).

In the harbour a total of 81 animals consisting of 3 spp. were trapped during the 5 months period. The trap success ranged from 1.0 to 3.9 % with an average of 2.3 % (Table 1). Species composition was 32.1 % *S. murinus*, 4.9 % *B. indica* and 63.0 % *R.r. diardii.*

In the villages a total of 832 animals consisting of 3 spp. was also trapped duting the period. The trap-success ranged from 20.9 to 24.5 % with an average of 21.9 % (Table 1). Species composition was 8.7 % *S. murinus*, 0.4 % *M. musculus* and 90.9 % *R.r. diardii.*

Tabel 1. Percent of trap-successes of rats and insectivores of Cilacap harbour and its adjoining village from Nov. 1985 to March 1986

Months	No. of trapnights	*Suncus murinus*		*Badicota indica*		*Rattus r. diardii*		*Mus musculus*		Total	
		Total	%	Total	%	Total	%	Total	5 %	Total	%
Godowns											
November 1985	600	4	0,66	2	0,33	16	2,66	0	0	22	3,66
December	700	12	1,71	0	0	15	2,14	0	0	27	3,85
January 1986	700	8	1,14	0	0	9	1,28	0	0	17	2,42
Februari	696	0	0	2	0,28	5	0,71	0	0	7	1,0
March	800	2	0,25	0	0	6	0,75	0	0	8	1,50
	3476	26	0,74	4	0,11	51	1,46	0	0	81	2,33
Villages											
November 1985	592	1	0,16	0	0	141	23,81	3	0,50	145	24,49
December	700	11	1,57	0	0	133	19,0	0	0	144	20,57
January 1986	820	25	3,04	0	0	147	17,92	0	0	172	20,97
February	794	24	3,02	0	0	158	19,89	0	0	182	22,92
March	900	11	1,22	0	0	178	19,77	0	0	189	21,0
	3806	72	1,89	0	0	757	19,88	3	0,07	832	21,86

Panjang Seaport and its adjoining villages.

The species composition differs from that of Cilacap areas, although there are also 4 spp. of animals identified. They were *S. murinus*, *R. norvegicus*, *R.r. diardii* and *M. musculus*.

In the harbour 72 animals consisting of 44.4 % *S. murinus*, 5.6 % *R. norvegicus* and 50 % *R.r. diardii* were trapped during the period. The trap-success ranged from 0.6 to 1.8 % with an average of 3.9 % (Table 2).

In the villages 616 animals comprised of 13.5 % *S. murinus*, 7.5 % *R. norvegicus*, 78.9 % *R.r. diardii* and 0.1 % *M. musculus* were trapped. The trap success ranged from 22 to 39.4 % with an average of 29.8 % (Table 2).

Tabel 2. Percent of trap-success of rats and insectivores of Panjang harbour and its adjoining villages from November 1985 to March 1986.

Months	No. of trapnights	*Suncus murinus*		*Rattus norvegicus*		*Rattus r. diardii*		*Mus musculus*		Total	
		Total	%	Total	%	Total	%	Total	%	Total	%
Godowns											
November 1985	620	2	0,32	0	0	2	0,32	0	0	4	0,64
December	160	8	5,0	0	0	6	3,75	0	0	14	8,75
January 1986	369	13	3,52	3	0,81	16	4,33	0	0	32	8,67
February	315	7	2,22	0	0	8	2,53	0	0	15	4,76
March	394	2	0,50	1	0,25	4	1,01	0	0	7	1,77
	1858	32	1,72	4	0,21	36	1,93	0	0	72	3,87
Villages											
November 1985	472	20	4,23	1	0,21	165	34,95	0	0	186	39,40
December	482	9	1,86	0	0	97	20,12	0	0	106	21,99
January 1986	348	20	5,74	26	7,47	65	18,67	1	0,28	111	31,39
February	388	31	7,98	17	4,38	65	16,75	0	0	113	29,12
March	380	3	0,78	3	0,78	94	24,73	0	0	100	26,31
	2070	83	4,0	47	2,27	486	34,47	1	0,04	616	29,75

Flea indices

In Cilacap harbour, the specific and crude flea indices of *R.r. diardii* were 3.2 and 2.0 and that of *S. murinus* was 1.6 and 0.3 fleas. None of the 4 *B. indica* examined was positive. In its adjoining villages *R.r. diardii* was again shown to have the highest flea index with 3.4 and 2.1. against *S. murinus* of 2.1 and 0.6 fleas. (Table 3).

In Panjang harbour, the spedific and crude flea-indices of *R.r. diardii* were 3.6 and 1.7, while that of *S. murinus* was 1.7 and 0.9 flea. Only a single *R. norvegicus* of 4 examined was with 5 fleas. It its adjoining villages, the flea-indices of *R.r. diardii* was 3.2 and 1.6 and that of *S. murinus* was 1.5 and 0.9 fleas (Table 3).

Tabel 3. Flea-indices of rats and insectivores of Cilacap, Central Java and Panjang, Sumatera and their adjoining villages from November 1985 to March 1986.

Nov. 1985 to March 1986	*Suncus murinus*					*Rattus r. diardii*					*Bandicota indica*					*Mus musculus*	
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2
CILACAP																	
Godowns	26	23.1	1.6	0.3	1–2	51	64.7	3.2	2.0	2.2–4.9	4	0	0	0	0	0	0
Villages	72	33.3	2.1	0.6	1.7–2.6	757	60.8	3.4	2.1	2.6–5.5	0	0	0	0	0	3	0
PANJANG	*Suncus murinus*					*Rattus r. diardii*					*Rattus norvegicus*					*Mus musculus*	
Godowns	32	53.1	1.7	0.9	1–5	36	66.7	3.6	1.7	2.3–4.0	4	50.	2.5	1.2	0–2.5	0	0
Villages	83	31.3	1.5	0.4	1.1–2.2	486	52.5	3.2	1.6	3.0–3.4	47	46.8	2.9	1.3	0–4.4	1	0

1) Number of animals examined
2) Percentage infestd
3) Specific infested
4) Crude flea-index
5) Monthly flea-index range.

Insecticide succeptibility tests :

The results of the susceptibility tests of *Xenopsylla cheopis* at Cilacap harbour and its adjoining villages show the fleas were highly sensitive to malathion 5.0 % and fenitrothion 1 % impregnated papers, and susceptible to DDT 4 % also (Table 4). The fleas at Panjang harbour and its adjoining villages were also shown to be very sensitive to malathion and fenitrothion, but DDT was shown to be less sensitive as at 8 hrs exposure 100 % mortality was not achieved.

Table 4. Precentage mortality, LT50 and LT95 for *Xenopsylla cheopis* tested with various insecticides impregnated papers in Cilacap, Central Java and Panjang, Sumatera.

No. of Concentration of insecticides	fleas tested 1)	Exposure time (hr) & % mortality (hr)							LT50 (hr) 1)	LT95 (hr) 2)
		No. of fleas in control (% mortality)	0.125	0.25	0.5	1	2)	4	8		
CILACAP											
DDT 4%	160	40(0)				2.5	7.5	92.5	100	2.33	4.92
Malathion 5.0%	123	37(0)	45.0	58.0	98.5	100	1			0.22	0.62
Fenitrothion 1.0%	137	40(0)	46.5	85.0	95.0	100				0.12	0.5
PANJANG											
DDT 4%	60	40(0)				20.6	45.0	70.0	90.0	2.3	11.6
Malathion 5.0%	96	40(0)	20.0	40.0	58.3	95.0				0.3	0.6
Fenitrothion 1.0%	100	30(0)	30.0	40.0	60.0	96.7				0.25	0.57

1) Four duplicates with ± 10 fleas for each exposure time
2) Percent mortality were plotted on logarithmic probability papers and degression line eye-fitted.

Other Ectoparastites :

Ectoparasites, other than fleas recovered from rats and insectivores, were also examined. Two species of chiggers *(Aschongastia indica, Leptotrombidium (L.) deliensis)* and five species of Laelaptic and and Dermanyssid mites *(Laelaps echidninus, L. myonyssognothus, L. nutalli, H. soricis, Ornithonyssus* sp.) were identified.

The laelaptic and dermanyssid mites which are nest dwelling in habits, were found to be prevalent in *R.r. diardii* of villages in Cilacap and Panjang harbours. In Panjang harbour these parasites were also found in *S. murinus* and *R.r. diardii.* Low prevalence of these mites were shown in *S. murinus* and *R. norvegieus.* A few *M. musculus* examined in these villages were free from infestation, and none of the insectivores and rats examined in Cilacap harbour was found infested.

Chiggers which are field dwelling in habits, were recovered from *R.r. diardii* in Cilacap only. The two chigger species were found in 3 of 757 *R.r. diardii* examined.

DISCUSSION

Based on the present study, the density of rats and insectivores was very low in the godowns of Cilacap and Panjang harbours, however, high density of these animals was found in houses of their adjoining respective villages. At the period of the study, most of the active godowns were stored with materials other than consumable foods, and this probably reflected the density of rats there. In the godowns of Semarang and Ujung Pandang harbours, the density of these animals was 2½ times higher than the present surveys because of the availability of more consumable foods stored in active godowns[1].

In residential houses of the villages, high density of these animals were influenced by the availability of more foods, shelters and harbourages in most of the households. The density was 10.3 and 8.6 times higher in these villages than that found in the harbours.

It was interesting to note that *R. norvegicus*, a typical seaport rat, is not found in Cilacap harbour as well as its adjoining villages. This rat is very common and abundant in seaport areas studied at Tanjung Priok[2], and also Semarang and Ujung Pandang harbours and their adjoining villages[1], It is most unusual that this rat has still not penetrated into the harbour despite of international ships anchored there periodically which occasionally harbour this rat with them. The absence of this rat in the present survey could be due to either (1) that the existing rat control measure undertaken by the Port Health authority is effective in preventing the animal from boarding out of international ships into the harbour areas, or (2) the rat is there, but in low numbers, and has yet to be caught. In Cilacap harbour, the presence of *B. indica*, a strictly field rat, was caught in outdoors of the animal quarantine houses. Although only 4 of these rats were caught, however it represents the first record of this rat being found inside the harbour. This rat was first discovered in the field at Ancol, about 5 kilometers from the Tanjung Priok harbour[3].

R. exulans, commonly found in Tanjung Priok, Semarang harbours and their adjoining villages, and less common in Ujung Pandang and its adjoining vil-

lages [1,2], was not found in both Cilacap and Panjang seaport areas. In its absence, *R.r. diardii* was shown to be the most predominant and abundant rat, and *S. murinus* was also found in relative numbers.

The rat-flea, *X. cheopis* density was observed to be lower in the present study areas than that observed in Semarang and Ujung Pandang seaport areas[1]. The spedific flea-index of individual animals species was found to be higher in *R.r. diardii* than any of the other animal species examined.

Other ectoparasites, particularly the nest-dweller miter were very common in *R.r. diardii* than the other animals examined. One of the two chigger spp. *(Leptotrombidium (L.) deliensis)* recovered from *R.r. diardii* is an established scrub typhus vector. This chigger is very prevalent among field rodents, and also accasionally found in *R.r. diardii*[4-5].

Insecticide susceptibility tests to *X. cheopis* with impregnated papers, revealed the fleas in Cilacap seaport areas were susceptible to all the 3 kinds of insecticides tested. In Panjang seaport areas the fleas were highly susceptible to malathion and fenitrothion, but does r ot seem to be very sensitive to DDT. In previous testing of these same insecticides to *X cheopis* in Semarang and Ujung Pandang seaport areas, this flea was shown to be very sensitive to all the 3 insecticides[1].

RECOMMENDATION

1. The density of rats in both the Cilacap and Panjang seaports areas were more concentrated in their adjoining villages than that inside the harbours. Rodent control inside the harbours would not be practical in terms of cost-effectiveness for such low density. It is suggested that flea control would be more appropriate in these harbours.

2. For flea control, malathion or fenitrothion insecticides are more preferable than DDT in the godowns of these harbours.

3. Rodent control through Port Health Authority in these port areas adjoining villages is not practicable. The high density of rodents in these villages could be checked through health education of the village community, such as improve sanitation, eliminating harborages of rodents in houses, improve garbage and waste-foods disposals, and any other preventive measures deems fit.

SUMMARY

Rodent and flea survey was carried out in Cilacap and Panjang port areas from November 1985 to March 1986. Four species of rodents, *Rattus r. diardii, R. norvegicus, Bandicota indica* and *Mus musculus*, and an insectivore, *Suncus murinus* were identified. The density of these animals was low inside the harbours, and high in their adjoining villages. *R.r. diardii* was shown to be the most abundant rats inside the harbours as well as in houses of the villages.

The *Xenopsylla cheopis* density was shown to be with low indices among the rodents and insectivores in both the seaport areas. The specific flea-index of individual animal species was found to be higher in *R.r. diardii* than the other animal spp. examined.

Insecticide susceptibility tests to *X cheopis* with DDT 1%, malathion 0,5 % and fenitrothion 1% impregnated papers

found the fleas were more sensitive to malathion and fenitrothion than DDT in both seaport areas.

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